

REMARKS

Reconsideration of the above-captioned application is respectfully requested.

Applicants confirm the election of the Group I invention defined by claims 1-4 and 18.

The present invention relates to aircraft tires, which must withstand very severe loads at relatively high pressure. Due to the fact that it is absolutely required, for safety reasons, that the tire carcass resist at least 4 times the inflation pressure in use, persons skilled in the art related to these kind of tires would tend to increase the number of reinforced plies in the carcass, the ends of which would be anchored in respective beads. Due to the relatively high number of carcass plies, and thus ply ends, there is a greater tendency for bead separation to occur during the severe use to which the tires are subjected.

Traditionally, that problem has been dealt with by adding reinforcement plies in the bead area close to the anchored ends of the carcass plies. However, the additional tire weight resulting from such a solution is contrary to the continuous efforts to reduce aircraft weight. Thus, it is desired to enhance bead endurance in an aircraft tire, but without significantly increasing tire weight.

The presently claimed invention has, somewhat surprisingly, achieved that goal. That invention involves using, as carcass reinforcement, a plurality of textile reinforcement cables oriented at an angle of between 80° and 100° with the circumferential direction. The carcass reinforcement is anchored to at least one circumferential reinforcement armature disposed within each bead. The elongation characteristics of each cable as a function of tensile force are defined by a force/elongation curve having first and second curve parts disposed on opposite

sides of a transition point lying within a range of the curve corresponding to 1% to 7% cable elongation. A first tangent at a point of the first curve part corresponding to zero cable elongation has a first gradient. A second tangent at a point of the second curve part corresponding to cable elongation at break is between 0.08 and 1.0. A tensile load at cable break is greater than 70 cN/tex.

That improved tire structure, which is recited in new claim 20 (based upon a combination of original claims 1 and 2), provides improved bead endurance and is not disclosed or suggested by the prior art of record.

Original claim 2 (now incorporated into claim 20) was rejected as obvious over Sheperd et al in view of Watanabe et al, Shoyama and Ueyoko et al.

Sheperd et al (U.S. Patent No. 4,155,394) teaches the use of cords for carcass reinforcement, the cords comprising a plurality of dissimilar plies of individual yarns helically cabled together. This patent does not teach or suggest to use this kind of reinforcement for the carcass of aircraft tires. Regardless, Sheperd et al. does not disclose reinforcing cables having the presently claimed characteristics. In the Attachment, the stress/strain curves shown in Figs. 2 and 3 of Sheperd et al have been analyzed using the presently claimed criteria. That is, in the Attachment two tangents T1 and T2 have been drawn at the respective points corresponding to zero elongation, and where cable breakage occurs (cable break). The location where those tangents intersect is observed and compared with the range 1% to 7% cable elongation as recited in claim 20. Also, the ratio of the gradients E1 and E2 of the two tangents is compared to the 0.08 to 1.0 cable elongation recited in claim 20. (The 3 Aramid example in Fig. 2 was not analyzed since the "curve" is a linear line and no tangent can be drawn.)

Fig. 2 – 1 aramid/2 Nylon

In this cable, the tangents intersect at a point near 11% cable elongation, as compared to the presently claimed range of 1-7%. (Also, the gradient E2 of the second tangent T2 is 90%, contrary to the recitation in dependent claim 24.)

Fig. 2 - 3 Nylon

In this cable, the tangents T1, T2 intersect near 10% cable elongation (compared to the claimed 1-7% range), and the ratio of E1 to E2 exceeds the claimed ratio of 0.08-1.0 by an appreciable amount.

Fig. 3 – 3 Nylon

In this cable, the tangents T1, T2 intersect at a very high location, well off the chart.

Fig. 3 – 3 Polyester

In this cable, the tangents intersect at about 9% cable elongation (as compared to the claimed 1%-7% range), and the ratio of E1 to E2 exceeds the claimed ratio of 0.08-1.0 by an appreciable amount.

Fig. 3 – 1 Polyester/2 Nylon

In this cable the tangents intersect at about 18% cable elongation (as compared to the claimed range of 1% - 7%), and the ratio of E1 to E2 exceeds the claimed ratio of 0.08-1.0 by an appreciable amount.

Thus, it will be appreciated that the cable characteristics disclosed in claim 20 are not disclosed in Sheperd et al. Nor do they appear to be disclosed in any of the secondary references. It is not seen that any motivation exists whereby an artisan redesign an aircraft tire reinforcement in line with that which is claimed.

Accordingly, it is submitted that claim 20 distinguishes patentably over the applied prior art. Dependent claims 21-26 recite further advantageous features of the invention. (Note: claims 21-23 are based on original claims 3, 4 and 18, respectively; the claim 24 subject matter is new; and claims 25 and 26 are based upon original claims 16 and 17, respectively, which were restricted out, but linked by original claim 1 (and also linked by new claim 20).

Allowance of claims 20-26 is respectfully solicited.

Respectfully submitted,

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